

Exploring agricultural structure as a determinant for social and aesthetic functions of agricultural production

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“Schreiben ist gut,
Denken ist besser.
Klugheit ist gut,
Geduld ist besser.”
(Siddhartha, Hermann Hesse)

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Summary

This PhD thesis investigates the connection between structures of different agricultural systems and functions of agriculture other than the production of agricultural goods. The concept of multifunctionality in agriculture is based on the fact that agriculture produces many non-marketed non-commodity outputs alongside the production of food and fiber. Examples include biodiversity, aesthetic landscapes, water and soil protection, and cultural traditions. My comparative analysis focused social functions of agriculture and on the aesthetic function by providing agricultural landscapes.

The study regions were chosen to allow for comparison between a small-scale farming system dominated by family farms and a large-scale farming system dominated by commercial non-family farms (e.g. cooperatives). The four research papers in this dissertation focus on different agricultural functions while always seeking to detect and observe influences of agricultural systems and structures on these functions. For the small-scale, family farm based system, Switzerland serves as a blueprint throughout the project. Here, agricultural policy has more or less preserved the traditionally small-scale farm structure through a high level of subsidies. For the three research papers focusing on social aspects of farming (Papers 1 to 3), the large-scale, non-family farm based, more industrialized system is represented by the two Northeast German states of Brandenburg and Mecklenburg Western Pomerania. In both study regions (i.e. Switzerland and Northeast Germany), farm household surveys were conducted which included questions on farmers' work satisfaction and on indicators of their social interconnectedness. The fourth research paper deals with agriculture's function of providing and maintaining aesthetic cultural landscapes. For this purpose, stated preferences of the general public were collected using choice experiments in two regions that stand for small-scale, family farm based systems and in one representing a large-scale, more industrialized system. The first two are Switzerland and South Germany (represented by the states of Baden-Württemberg and Bavaria) and the latter is East Germany, comprising all German federal states that formerly constituted the German Democratic Republic.

The findings within these subprojects show differences and commonalities between both systems and different effects of agricultural structural elements. Differences in farmers' work satisfaction only become apparent when the structure is accounted for (Paper 1). Whereas average work satisfaction of Northeast German farmers generally does not differ significantly from that of Swiss farmers, multivariate analysis reveals that Swiss farmers

are more satisfied with their agricultural work when the effects of structural variables are factored out. These include farm size, financial situation of the farm, and methods of production (organic/conventional). However, there are differences in the role that monetary utility of farm work plays for work satisfaction. Due to better use of economies of scale in large-scale Northeast German agriculture, its production is more economically profitable than in the Swiss system, where a larger proportion of agricultural income is derived from state subsidies. The proxies for farm profitability in this study were the financial situation of the farm as perceived by the farmer as well as, with respect to economies of scale, farm size. In Northeast Germany, both proxies are positively related to work satisfaction, whereas among Swiss farmers both proxies have a significantly different effect. In the structurally more homogeneous Swiss agricultural system, farm size has no effect on farmers' work satisfaction and the perceived financial situation of the farm is significantly less influential than in the Northeast German case.

The second paper sheds light on positive effects of the diversification of daily work routine on farmers' work satisfaction. The results highlight the relevance of diversification, especially for Swiss farmers. Swiss farmers are more satisfied with their work if the farm has several production branches and/or if the farm pursues non-agricultural, income generating activities (e.g. direct marketing or agrotourism). In Northeast Germany, the number of production lines does not significantly affect farmers' work satisfaction, which might reflect the fact that specialized farms are commercially more successful. This again could be related to the relationship between monetary utility of farm work and work satisfaction found in the first paper. Furthermore, the results show that farmers in both regions share an increasing dissatisfaction with farm work the more they work off the farm. Either unsatisfactory farm work leads farmers to take up off-farm employment or this result needs to be related again to monetary utility of farm work. The latter could indicate that a poor financial situation of the farm pressures the farmer into off-farm employment which then results in dissatisfaction with the non-profitable farm work.

The third paper deals with farmers' connection to their local communities. Swiss farmers and farmers on smaller farms have more locally based social networks. Furthermore, farmers on smaller farms have a stronger sense of community belonging. Farmers on larger farms have more close friends and relatives living farther away from the farm and also have a weaker sense of belonging to their community than small-scale farmers. As is the case for work satisfaction, the connection between farms and local communities is positively affected by farm diversification into non-agricultural activities. The results further exemplify that locally-rooted farm businesses can be important for social cohesion in rural areas. However, what counts is the provenance of the farmer and not the legal form of the

farm (i.e. family farm or e.g. cooperative).

The results of the choice experiments (Paper 4) show that Swiss people and people from both German regions do not differ significantly in terms of their preferences for agricultural landscapes. In all three regions, the samples could be subdivided into a smaller group of more conservative respondents and a group of more change-oriented respondents. In all regions, the latter group generally prefers to change the status quo of agricultural landscapes and contains the majority of respondents. Forest loss as well as changes in plot sizes of agricultural land and forests are uniformly rejected in all regions, with the exception that Swiss change-oriented respondents are not significantly against increases in plot sizes. Respondents from small-scale agricultural systems have the greatest willingness to pay for increasing biodiversity in the agricultural landscape and, in contrast to respondents from the German regions, the Swiss preference for biodiversity applies to both respondent groups. The majority of the respondents, furthermore, prefers an increase in free range animal husbandry in the landscape and, especially in the small-scale systems, more areas for meadow orchards.

Zusammenfassung

Diese Doktorarbeit untersucht die Verbindung zwischen der Agrarstruktur unterschiedlicher Landwirtschaftssysteme und verschiedenen Funktionen der Landwirtschaft jenseits der Güterproduktion. Das Konzept der Multifunktionalität in der Landwirtschaft basiert darauf, dass die Landwirtschaft potentiell vielfältige immaterielle und nicht-marktfähige Leistungen erbringt, die an die Produktion landwirtschaftlicher Güter gekoppelt sind. Beispielhaft sind hier die mit der Landwirtschaft verbundene Biodiversität, Kulturlandschaftspflege, Gewässer- und Bodenschutz oder die Aufrechterhaltung kultureller Traditionen zu nennen. Meine komparative Untersuchung konzentriert sich auf soziale Funktionen der Landwirtschaft sowie auf das von ihr produzierte Landschaftsbild.

Die Untersuchungsregionen wurden der Art ausgesucht, dass ein kleinbäuerliches, hauptsächlich durch Familienbetriebe dominiertes Landwirtschaftssystem mit einem großstrukturierten, gewerblichen und durch Nichtfamilienbetriebe (z.B. Genossenschaften) dominierten verglichen werden konnte. Die vier Forschungsartikel dieser Arbeit fokussieren unterschiedliche landwirtschaftliche Funktionen und versuchen jeweils den Einfluss der unterschiedlichen Agrarsysteme und -strukturen auf die Funktionen herauszuarbeiten und zu erklären. Die Schweiz dient in der gesamten Untersuchung als Blaupause für ein kleinbäuerliches Agrarsystem, dass durch das hohe Subventionslevel der Schweizer Agrarpolitik in seiner vergleichsweise kleinmaßstäbigen Betriebsstruktur bis heute mehr oder weniger aufrechterhalten werden konnte. In den drei Forschungsartikeln, deren Kern die Untersuchung sozialer Aspekte landwirtschaftlicher Produktion ist (Artikel 1 bis 3), repräsentieren die nordostdeutschen Bundesländer Brandenburg und Mecklenburg-Vorpommern das großstrukturierte, durch Nichtfamilienbetriebe dominierte und stärker industrialisierte Landwirtschaftssystem. In beiden Untersuchungsregionen, Schweiz und Nordostdeutschland, wurden schriftliche Befragungen landwirtschaftlicher Haushalte durchgeführt, die beispielsweise Fragen zur Arbeitszufriedenheit der Betriebsleiter und zu Indikatoren für ihre soziale Vernetzung beinhalteten. Der vierte Forschungsartikel beschäftigt sich mit der landwirtschaftlichen Funktion der Kulturlandschaftsgestaltung und -erhaltung. Hierfür wurden mithilfe von Choice Experimenten die Landschaftspräferenzen der Schweizer, der süddeutschen (d.h. Baden-Württemberg und Bayern) und der ostdeutschen Bevölkerung (d.h. neue Bundesländer) erfasst. Die Schweiz und Süddeutschland stehen hierbei für das kleinstrukturierte, bäuerliche und Ostdeutschland für das großstrukturierte, stärker industrialisierte Agrarsystem.

Die Ergebnisse dieser Teilprojekte zeigen Unterschiede und Gemeinsamkeiten zwischen beiden Systemen und beleuchten unterschiedliche agrarstrukturelle Einflüsse auf die jeweiligen landwirtschaftlichen Funktionen. Unterschiede in der Arbeitszufriedenheit der Bauern zeigen sich nur, wenn die Agrarstruktur miteinbezogen wird (Artikel 1). Während sich die durchschnittliche Arbeitszufriedenheit nordostdeutscher Bauern generell nicht signifikant von jener der Schweizer Bauern unterscheidet, zeigt sich in der multivariaten Analyse, dass Schweizer Bauern zufriedener mit ihrer landwirtschaftlichen Arbeit sind, wenn für Einflüsse verschiedener Strukturvariablen korrigiert wird. Zu diesen Variablen gehören unter anderem die Betriebsgröße, die finanzielle Lage des Betriebs sowie die Produktionsweise (biologisch/konventionell). Jedoch zeigen sich Unterschiede in der Bedeutung des monetären Nutzens landwirtschaftlicher Arbeit für die Arbeitszufriedenheit. Durch die bessere Nutzung von Skaleneffekten in der großbetrieblich strukturierten nordostdeutschen Landwirtschaft kann diese ökonomisch profitabler produzieren als die Schweizer, in der ein größerer Teil des landwirtschaftlichen Einkommens aus staatlichen Subventionen generiert wird. Als Ersatzvariablen für das Betriebseinkommen wurden aufgrund der Skaleneffekte die Betriebsgröße sowie die vom Bauern bewertete finanzielle Situation des Betriebs herangezogen. In Nordostdeutschland haben beide Variablen einen positiven Effekt auf die Arbeitszufriedenheit der Bauern, wohingegen sich die Effekte für Schweizer Bauern signifikant von den nordostdeutschen unterscheiden. In der strukturell homogenen Schweizer Landwirtschaft hat die Betriebsgröße keinen Einfluss auf die bäuerliche Arbeitszufriedenheit und die finanzielle Lage des Betriebs hat einen signifikant schwächeren Einfluss als unter nordostdeutschen Landwirten.

Im zweiten Artikel wird der positive Einfluss der Diversifizierung der täglichen Arbeitssroutine auf die Arbeitszufriedenheit näher beleuchtet. Die Ergebnisse zeigen die Relevanz von Betriebsdiversifizierung besonders für die Schweizer Bauern. Schweizer Bauern sind zufriedener mit ihrer Arbeit wenn ihr Betrieb mehrere Produktionszweige und/oder nicht-landwirtschaftliche, aber einkommensgenerierende Tätigkeiten hat (z.B. Direktvermarktung oder Agrartourismus). In Nordostdeutschland hat die Anzahl der Betriebszweige keinen signifikanten Einfluss auf die Arbeitszufriedenheit der Bauern, was damit zusammenhängen könnte, dass spezialisierte Betriebe kommerziell tendenziell erfolgreicher sind. Dies wiederum könnte mit den im ersten Artikel gefundenen Zusammenhängen zwischen dem monetären Nutzens landwirtschaftlicher Arbeit und der Arbeitszufriedenheit in Beziehung gebracht werden. Weiterhin zeigen die Ergebnisse, dass Bauern beider Regionen unzufriedener mit ihrer landwirtschaftlichen Arbeit sind, je mehr sie nebenberuflich außerhalb des Betriebs arbeiten. Entweder eine nicht-zufriedenstellende landwirtschaftliche Arbeit bringt die Bauern dazu eine Arbeit außerhalb des Hofes aufzunehmen oder dieses

Ergebnis muss wieder in Verbindung mit dem monetären Nutzen landwirtschaftlicher Arbeit gesehen werden. Letzteres würde bedeuten, dass ein Bauer, dessen Betrieb finanziell schlechter dasteht, sich gezwungen sieht eine Arbeit außerhalb des Betriebs anzunehmen und die verbleibende nicht ertragreiche, landwirtschaftliche Arbeit als nicht zufriedenstellend wahrnimmt.

Der dritte Artikel beschäftigt sich mit der Verbindung zwischen Bauern und ihren Gemeinden. Schweizer Bauern und Bauern kleinerer Betriebe haben stärker lokal ausgerichtete Netzwerke. Auch fühlen sich Bauern kleinerer Höfe stärker ihrer Gemeinde zugehörig. Die engen Freunde und Verwandten von Betriebsleiter größerer Betriebe wohnen eher weiter entfernt und diese Betriebsleiter haben zudem ein geringeres Zugehörigkeitsgefühl zu ihrer Gemeinde als solche kleinerer Betriebe. Wie auch schon in der Untersuchung zur Arbeitszufriedenheit hat die Diversifizierung des Betriebs in nicht-landwirtschaftliche Tätigkeiten einen positiven Effekt auf die Verbindung zwischen Höfen und den lokalen Gemeinden. Eine weitere Erkenntnis ist, dass lokal verwurzelte Betriebe einen erheblichen Beitrag zum sozialen Zusammenhalt in ländlichen Gebieten leisten können, jedoch ist die Herkunft des Landwirts von größerer Bedeutung als die Rechtsform des Betriebs (d.h. Familienbetrieb oder z.B. Genossenschaft).

Die Ergebnisse der Choice Experimente (Artikel 4) zeigen, dass Menschen aus der Schweiz und aus den beiden deutschen Untersuchungsregionen keine besonders unterschiedlichen Präferenzen für Agrarlandschaften haben. In allen drei Regionen konnten die Stichproben sinnvoll in zwei Gruppen unterteilt werden: eine kleinere mit eher konservativen Befragten und eine mit stärker wandel-orientierten Befragten. Die zweite Gruppe aller Regionen präferiert es generell den Status Quo der Landschaft zu verändern und stellt die Mehrheit der Befragten. Waldverlust und Veränderung der Schlaggrößen von landwirtschaftlichen und forstlichen Flächen werden in allen drei Regionen gleichermaßen abgelehnt, mit der Ausnahme, dass die wandelaffinen Schweizer einer Vergrößerung der Schläge neutral gegenüberstehen. Befragte der kleinstrukturierten Agrarsysteme haben zudem für eine Zunahme der Biodiversität in der Agrarlandschaft die höchsten Zahlungsbereitschaften und im Gegensatz zu den deutschen Regionen ist die Präferenz für Biodiversität in der Schweiz ein gruppenverbindendes Element. Die Mehrheit der Befragten möchte zudem mehr Freilandhaltung von landwirtschaftlichen Nutztieren in der Landschaft und, besonders in den kleinstrukturierten Agrarsystemen, mehr Flächen mit Streuobstwiesen.

Chapter 1

Introduction

Agriculture is a multifaceted part of the global economy and undoubtedly the backbone of every society. There are countless nuances of different agricultural production systems ranging from manually driven subsistence agriculture in the developing world to the modern and highly engineered industrial agriculture in developed countries. The main purpose of agricultural production anywhere is certainly the production of food and fiber, and this is also the most obvious function as these products are traded on markets.

Alongside the production of agricultural commodities, however, non-commodities are generated as by-products. These outputs may not be traded and therefore have no price which can be the basis for market failures (Van Huylenbroeck et al., 2007). They are often not integrated into the calculations of welfare effects from agricultural production even though they might have tremendous positive and/or negative impacts (Randall, 2007; Renting et al., 2009; Lefebvre et al., 2014). Positive externalities include biodiversity, aesthetic landscapes, and protection from floods and avalanches. Additionally, agriculture is always linked to and can be significant for rural areas, for example by maintaining regional cultural heritage, creating employment opportunities, or providing or maintaining a region's rural infrastructure (Müller et al., 2008). Negative externalities generated in the production process often comprise interferences with the environment such as nitrate or pesticide leaching to groundwater or to other water bodies or soil erosion (Van Huylenbroeck et al., 2007).

The concept of multifunctionality generally emphasizes the importance of focusing on commodity outputs while at the same time promoting the provision of positive non-commodity outputs and minimizing negative ones (OECD, 2001). In Europe, the concept has found its way into agricultural policies to different extents. Maintaining the multiple non-production functions of agriculture has mostly been achieved through public payments to farmers, often bound to cross-compliance. Nowadays, there are many different agricul-

tural production systems on the European continent varying for example in production intensity, production method, or scale of production. Due to regional disparities in topography, climate, and culture, quite diverse systems can be found in relatively close proximity to each other.

Most of the continent's countries are members of the European Union (EU) and thus subject to regulations introduced under the Common Agricultural Policy (CAP). Switzerland, as a non-EU Member State, follows its own path concerning the orientation of agricultural policy. Public subsidies accounted for more than 60% of the factor income of Swiss agriculture in 2014, whereas in the EU-15 the proportion was less than 40% (Bundesamt für Statistik, 2015). Swiss agriculture is therefore much more protected from market forces than other European regions, such as the more intensively producing East German agricultural sector.

In Switzerland, nearly all agricultural land is managed by small family farms with an average size of around 19 ha (Bundesamt für Landwirtschaft, 2014). Compared to this, the situation in East German agriculture is very different; here, most of the agricultural land is managed by large commercial non-family farms. For example, farms in the two Northeast German states of Brandenburg and Mecklenburg Western Pomerania have an average size of 238 ha and 286 ha respectively (SA B&L, 2011). As a result of the different scales and intensities of farming, agricultural production, together with other factors such as different regional topographies, has created landscapes that differ in appearance and in terms of certain landscape elements. Northeast German agricultural landscapes are, for example, more characterized by large-sized agricultural plots which results in more monotonous landscapes, whereas Swiss landscapes are more small-scaled and varied.

1.1 Research objectives

The objective of my dissertation is to investigate agricultural functions in different regional and systemic contexts. This is done by comparing East Germany and Switzerland as both regions have very differently structured agricultural systems. I intend to identify commonalities and differences regarding agricultural functions in relation to differences in intensity and scale of farming. The project's research has two major directions. First, the focus is placed on social functions of agriculture for the farmer herself, namely agriculture as a workplace, as well as on the farmer as a social element in rural communities. Here, certain social indicators are investigated and related to farm structure and system. For this part the large-scale farming system is represented by two Northeast German states, namely

Brandenburg and Mecklenburg Western Pomerania. Second, I focus on the aesthetics of agricultural landscapes; for this, I compare the study regions' populations regarding their preferences for certain landscape elements. Here, all six East German states represent the large-scale system, whereas two South German states are considered as small-scale systems in addition to Switzerland to be able to factor in potential cultural differences with respect to different nationalities.

1.2 Structure

The results from these different subprojects were condensed into four different research papers. Of these, three were concerned with social functions of agriculture and one with landscape aesthetics. Before presenting my research, I provide the theoretical background as an introduction to the applied research. Following on this first introductory chapter, Chapter 2 therefore introduces the concept of multifunctionality and its application in the agricultural sphere. This chapter also summarizes the major steps of the process by which the concept of multifunctionality was incorporated into the agricultural policies of our study regions, namely the EU's CAP and Swiss Agricultural Policy. Chapter 3 presents different understandings and research approaches concerned with multifunctional agriculture in the scientific approximation to the concept and relates these to my own research. Chapter 4 then comprises the four research papers. The first two papers focus on work satisfaction of farmers (Subchapters 4.1 and 4.2), the third on farmers' interconnections with their local communities (Subchapter 4.3), and the fourth on public landscape preferences (Subchapter 4.4). Chapter 5 draws an overall conclusion for this dissertation, comprising a brief discussion of the project's main findings and an outlook for future research.

Chapter 2

Multifunctional agriculture

The following chapter provides the theoretical basis for the empirical research in this project. First, I present the concept of multifunctionality and of multifunctional agriculture in more detail. In a second step, I show how the concept was incorporated into the agricultural policies of the EU and Switzerland.

2.1 The concept of multifunctional agriculture

In general, the term multifunctionality describes the fact that “an economic activity may have multiple outputs and, by virtue of this, may contribute to several societal objectives at once” (OECD, 2001, p. 11). This definition of multifunctionality shows that the concept is not restricted to agriculture, but may be adapted to other economic areas as well. Wilson (2007) reviews the history of the multifunctionality concept in different scientific disciplines and economic spheres and sees especially its development in forestry as a significant and early starting point. The recognition of forest functions other than timber production dates back to German forestry in the late 18th century. Especially in the second half of the 20th century, a gradual uptake of the concept of ‘multiple uses’ of forests into the objectives of national forestry policies was observed (Wilson, 2007). There is a close relationship between forestry and agriculture, for example regarding their dependence on land as an input factor and on natural processes for production, regarding the joint production of private and public goods, and regarding their relevance to the rural economy (OECD, 2001).

Compared with forestry, multifunctionality in agriculture came up rather late in academic and policy realms. It was not until the late 20th century that an acknowledgment of functions other than the production of food and fiber emerged in this sector. In a broad sense, multifunctional agriculture was defined as the joint production of multiple com-

modity and non-commodity outputs; some of the latter should be non-marketed or poorly marketed externalities or public goods (OECD, 2001). Multifunctionality is supposed to act as a corrective for market failures.

2.2 Multifunctionality in European agricultural policies

Especially those regions with high cost regimes and high subsidy levels were among the first to adopt the multifunctionality concept and to defend it strongly against criticism (Verdun and Croci, 2005). For example, in the EU, overproduction and consequential budgetary problems put the Common Agricultural Policy (CAP) under increasing pressure in the 1980s and the CAP's support and protection was contested by global trading competitors during World Trade Organization (WTO) negotiations (Wilson, 2007). As a reaction to these pressures, the 1992 MacSharry reform reduced price supports and included measures to reduce overproduction. Income losses were compensated via newly introduced direct payments coupled to production. Furthermore, 'accompanying measures' (e.g. agri-environment programs, afforestation, early retirement, diversification) were promoted (Lowe et al., 2002) representing the first measures that started to account for the multifunctional character of the EU's agriculture. The first formal commitment of the European Commission to multifunctional agriculture can be found in the Cork declaration of 1996, but without directly naming it (European Commission, 1996). Faced with eastern enlargement of the EU, policy-makers saw multifunctionality as a way to approach agricultural and rural issues in a more integrated and direct manner (van Meijl and van Tongeren, 2002; Verdun and Croci, 2005). Agenda 2000 introduced the second pillar to the CAP, under which funds were exclusively reserved for rural development and diversification measures (Granvik et al., 2012). With respect to compensating direct payments to farmers, a further decoupling from production was promoted (van Meijl and van Tongeren, 2002). Especially the subsequent mid-term review of Agenda 2000 (also known as the Fischler reform) brought massive changes in 2003. Besides decoupling of most CAP support through historically oriented Single Farm Payments (SFP), cross-compliance was made a requirement for these payments. This shifted the focus further away from sole production of agricultural commodities toward non-commodities such as environmental, animal welfare or food safety issues (Swinnen, 2008). The most recent reform step in the history of the CAP was the reform passed in 2013 which focused on an increased "greening" of agricultural production for the EU funding period 2014-2020. Green direct payments supplement the cross-compliance rules and are bound to certain practices such as crop diversification, the maintenance of permanent grassland, and a rededication of 5% of a farm's

arable land to ‘ecological beneficial elements’ (European Commission, 2014). Nevertheless, the greening proportion of total direct payments is rather small, accounting for only 30% of all direct payments (European Commission, 2016). Therefore, the effectiveness and extent of the greening measures with respect to environmental effects has been questioned (Popp and Jambor, 2015); they tend to be seen as a justification strategy by policy-makers as only minimal measures and budgets are directed towards environmental issues compared with the prominent position the greening argument occupies in official language (Erjavec and Erjavec, 2015). This shows that, while multifunctionality and the provision of public goods are still of importance – at least according to official wording, the efficiency of the related actions taken might be questionable.

The non-EU Member State Switzerland has surpassed the EU in integrating the multifunctionality concept into agricultural policy. Popp (2013) describes the main steps leading to a revision of Swiss agricultural law, from high protection of the agricultural sector by direct price and production supports towards an acknowledgment of agriculture’s multifunctional character supported by general and ecological direct payments. Swiss policy-makers faced similar problems as their EU colleagues. Overproduction, especially in the milk sector, high budgetary costs to guarantee prices for producers, and also pressures from WTO trading partners urged for a reform of Swiss Agricultural Policy. In 1990, a report for the Swiss Federal Office for Agriculture concluded that the future Swiss agriculture needed to be multifunctional and cross-compliance for direct payments was seen as the only means to guarantee public goods and services produced by agriculture (Bundesamt für Landwirtschaft, 1990). A new system of decoupled direct payments was passed by the Swiss parliament in 1993 and through a referendum of the Swiss population in 1996 the multifunctionality of Swiss agriculture was anchored as a goal in the national constitution. As future policy measures ought to be targeted in such a way that the agricultural sector can fulfill its multiple, constitutionally-anchored tasks and because the implementation of the concept was politically and not scientifically driven, Caron et al. (2008) categorizes the Swiss approach as being normative in nature. In 1998, a new agricultural law was introduced to promote more market-oriented and ecologically friendly agricultural production. Direct payments that were linked to cross-compliance with ‘Proof of Ecological Performance’ (PEP) now made up 75% of the total agricultural budget (previously 25%) and price supports were cut to comply with WTO liberalization requirements (Popp, 2013). Since 1998 the direct payment system has been further refined and, in the last reform in 2013, direct payments accounted for 81% of the entire Swiss Agricultural Policy budget. One key goal was to direct the payments from general instruments to the reimbursement of public goods (Bundesamt für Landwirtschaft, 2016).

Chapter 3

Research on multifunctional agriculture

The term “multifunctionality” has been used in different ways depending on the research focus and on the interpretation of the concept. Different categorizations of research approaches and of how the concept is understood and operationalized have been made. Marsden and Sonnino (2008), for example, identify three paradigms that underlie perceptions of multifunctionality in agriculture. Work done within the *agro-industrial paradigm* reduces multifunctionality in agriculture to pluriactivity. Here, multifunctionality acts as a lifeline for those least productive marginal farms that strive to keep up their farming activities through cross-financing with non-agricultural incomes. The authors call this approach “a palliative to the productivist ‘cost-price’ squeeze” (Marsden and Sonnino, 2008, p. 423). In the *post-productivist paradigm* multifunctionality is achieved through a land-based approach in which farms are not diversified but the farmland is. Agricultural land is functionally divided to accomplish multiple tasks at the same time (e.g. production, ecological, social, and aesthetic tasks). Production is only one function among others and is no longer unconditionally prioritized. Third, the *rural development paradigm* focuses on the potential symbiosis between farms and their rural surroundings via diversification of farming activities. Farms are not seen as isolated production cells, but also as providers for the region and society. The authors themselves claim that a multifunctional activity should add to the farm’s income (and to regional employment), yet not solely for farm survival. It should be an activity which also adds to the transformation of agriculture itself so that it is more directed towards societal needs and expectations (Marsden and Sonnino, 2008).

Renting et al. (2009) condense the eight original concept-oriented research clusters proposed by Caron et al. (2008) into four conceptual research approaches. Research within the

so-called *market regulation approaches* focuses on developing and structuring markets for non-marketed or poorly marketed non-commodity outputs and for the goods associated with them. Research categorized as following a *land-use approach* has a strong spatial focus on multifunctionality in agriculture and is applied on higher aggregated levels which disregards single actors (e.g. single farms) (Renting et al., 2009). This category resembles Marsden and Sonnino’s *post-productivist paradigm* as the focus is placed on the land as research unit. Scaling down to the single micro-level, research following an *actor-oriented approach* deals with multifunctionality and with decision-making processes on the farm level. Here, studies interpret multifunctionality more broadly and more functions are included such as quality of life or the maintenance of a dispersed rural settlement structure. Finally, studies dealing with public institutions and their role in the implementation and promotion of multifunctional agriculture finally are subsumed under *public regulations approaches* (Renting et al., 2009).

Both of these attempts to categorize perceptions of multifunctionality, as well as the research on multifunctionality, highlight the fact that the concept is far from uniformly used. This dissertation project changes the viewpoints on multifunctionality and thus interprets it more broadly. First, in an actor based approach, we will scale down to the single actor to investigate the effect of farm structure on the farmer and the farm as a workplace by observing farmers’ work satisfaction and their social interconnections with local communities. Second, we will scale up to the viewpoint of the general public and thus follow the land-use approach by looking into the aesthetic function of agricultural land. This second research step can be classified under the land-use approach. The following section presents research on these two levels which is related to this project’s research foci.

3.1 Actor-based approach – *Agricultural structure and the farmer*

Work satisfaction

For rural regions farms hold a social function through employment and income generation for farmers as much as for employees. Satisfaction with agricultural work is therefore a crucial issue, as young people need to be convinced that an occupation on a farm is meaningful and satisfactory. Nonetheless, work done on work satisfaction specifically focusing on farmers or farm employees is rare. In a recent study Näther et al. (2015) showed for North German farm workers that work satisfaction depends on different aspects of the

agricultural work itself. Among others, it is most strongly related to working conditions, the actual tasks, and the working atmosphere. In addition, it was found to be highly significantly correlated with life and health satisfaction (Näther et al., 2015). Mußhoff et al. (2014) also investigated the work satisfaction of farm workers and compared it with that of non-farm workers. Agricultural work seems to hold special value compared to other occupations, as work satisfaction measured on an 11-point Likert scale (ranging from 1 - *strongly below average* to 10 - *strongly above average*) averaged 7.4, whereas workers in other occupations averaged 5.9 points, a difference which was highly significant (Mußhoff et al., 2014). In Switzerland, the Federal Office for Agriculture publishes four-yearly data on farmers' satisfaction with different aspects of life. While family and health were always the most important aspects for Swiss farmers since 2001, both aspects were followed directly by education and occupation (Bundesamt für Landwirtschaft, 2013).

Being one's own boss and working independently, outside, and in nature are important positive aspects of agricultural work for people engaged in agriculture (Mußhoff et al., 2014; Bundesamt für Landwirtschaft, 2013). This coincides with earlier findings of an older study by Gasson (1973) on British farmers and their values related to farming. However, relatively low income and long working hours are seen as the most negative aspects of the occupation among Swiss farmers (Bundesamt für Landwirtschaft, 2013). Mußhoff et al. (2014) concludes that farm managers can improve workers' satisfaction by increasing incomes in times of high workload and through more free time when less workforce is needed as the perceived advantages of agricultural work cannot outweigh the feeling of being paid inadequately.

While these studies give valuable insights into the values that farmers and farm workers attribute to farming and into how working conditions influence work satisfaction, they lack an investigation of effects of farm structure (e.g. farm size or organic/conventional farming) from a systemic viewpoint. This issue, however, should be tackled, especially regarding the ongoing structural changes in agriculture. Gasson (1973) also analyzed her findings with regard to effects of farm size. She concluded that farmers with larger farms seem to be more motivated by economic aspects of farming, whereas intrinsic values, notably independence, seemed to prevail for farmers with small farms. However, she also highlighted that her results only allow for tentative conclusions and called for more research in this direction. My research addresses this call which, to the best of my knowledge, remains unanswered to date. Two articles within this dissertation project focus on the question of how different agricultural systems and farm structures influence the key element of agriculture, namely farm work itself.

Social interconnectedness

Another function which was for a long time inherent to agriculture is its natural bond with local communities. Besides providing employment as already mentioned, farms acted as suppliers to local communities, demanded input factors for production, cared for local infrastructure, and/or played important roles in communities' social and institutional life (Renting and van der Ploeg, 2001; Smithers et al., 2005; Müller et al., 2008; McManus et al., 2012). In particular, the effect of structural changes towards a modernized agriculture of increasing scale has triggered numerous studies in the past. One starting point being the Goldschmidt hypothesis which states that large-scale corporate agriculture would have detrimental effects on community well-being (Goldschmidt, 1947) a conclusion which was found valid in most other studies; however, many studies also yielded mixed findings, meaning that both positive and negative effects were found (Lobao and Stofferahn, 2008).

This ongoing, controversial scientific debate forms the background to the third article. Again, the focus is on Northeast Germany and Switzerland and structural elements of the agricultural systems are tested with regard to their influence on different measures of the connections farmers have to their local communities.

3.2 Land-based approach – *Agricultural structure and landscape preferences*

Landscape aesthetics

The questions of which landscapes and landscape elements appeal to people and which changes should be made in order to satisfy public needs, and which landscape elements are attractive to people, have been investigated for a long time and across disciplines. Bourassa (1991) defined three levels on which human preferences for aesthetic aspects of landscapes are induced. On the biological level, landscape preferences are innate, stem from the evolutionary development of mankind, and are constant over time and between social groups or cultures. Biologically influenced “habitat theories” built upon general, law-like observations that humans prefer open landscapes with groups of trees. Theories explained this either based on the visual similarity to the African Savannah where the first primitive humans lived (Oriens, 1980), with their basic need to be able to see predators and to hide from them at the same time (Appleton, 1975), or on humans' cognitive abilities as a survival-enhancing element which would be increased in such landscapes (Kaplan and Kaplan, 1989).

Landscape preferences on Bourassa’s cultural level are socially induced by cultural conventions or customs (Nassauer, 1995) and therefore might vary over time; they are transpersonal but at the same time intracultural (Bourassa, 1990). Buijs et al. (2006), for example, found that values which French and Dutch people attributed to landscapes evolved jointly over time, from more functional viewpoints to more hedonistic viewpoints (i.e. Arcadian landscapes representing the rural idyll or wilderness landscapes). While these results stem from culturally relatively similar countries, Petrova et al. (2015) determined strong correlations between the estimates of landscape attractiveness also for culturally relatively different Russian and Japanese respondents. Other studies compared groups of different cultural identities within a country (Buijs et al., 2009; Hoyos et al., 2009). For example, Buijs et al. (2009) observed cultural differences by comparing native Dutch people with Turkish and Moroccan immigrants. While the native Dutch were attracted by wilderness, immigrants preferred functional landscapes and disliked wild and unmanaged ones.

On the third, personal level biological and cultural influences are moderated and thus it holds the highest variability regarding landscape preferences (Bourassa, 1990, 1991). Commonly socio-economic factors such as household income, age, and education level are used to explain differences in landscape preferences. Findings of other studies also suggested, for example, effects of environmental attitudes and interests (Kaltenborn and Bjerke, 2002; Sevenant and Antrop, 2010; Junge et al., 2011).

To investigate whether and how landscape preferences differ across national borders and/or between agricultural systems the fourth article focuses on one large-scale system (East Germany) and two small-scale systems (South Germany and Switzerland). Choice experiments were conducted to assess people’s landscape preferences.

Chapter 4

Investigating non-production functions of agriculture

This chapter introduces the individual research papers which reflect the empirical work done on different non-production functions of agriculture in different agricultural structures. The first two papers (Sections 4.1 and 4.2) explain farmers' work satisfaction with different foci. Thus, these articles take a micro-perspective on agricultural functions as the meaning of agriculture for the single actor is investigated. The third paper (Section 4.3) relates the farmer to the community by concentrating on different measures that describe farmers' interconnectedness with their rural communities. The study is intended to give insights into the function of agriculture for rural areas. Although the single farmer remains the research subject the perspective is widened by linking the farmer to the community. For the fourth paper (Section 4.4) the perspective is changed yet again, away from the farmer toward the societal point of view on agricultural landscapes and thus also on agricultural production.

4.1 Paper 1 – *Which farm characteristics influence work satisfaction? An analysis of two agricultural systems*

The following article deals with the question of how farmers' work satisfaction is influenced by determinants of agricultural structure and how it differs between different agricultural systems. A special focus is placed on the connection between economic performance of the farms and work satisfaction.

Published in: *Agricultural Systems*

Besser, T. and Mann, S., 2015. Which farm characteristics influence work satisfaction? An analysis of two agricultural systems. *Agricultural Systems*, Volume 141, pp. 107-112, doi: <http://dx.doi.org/10.1016/j.agsy.2015.10.003>.

Abstract

This study explores the influences of agricultural systems on a social aspect of farming, namely work satisfaction. We use an individual activity choice model and hypothesize that different systems yield different levels of satisfaction with farming. Farmers of Northeast (NE) Germany and Switzerland were surveyed with a joint questionnaire, as these study regions differ widely in terms of farm size and thus in economies of scale. Regression analysis was done in two separate models including different proxies for farm income, namely farm size (n=1137) and perceived financial situation of the farm (n=1158). The results show that in the large-scale industrialized agricultural system of NE Germany, farmers' work satisfaction is positively affected by both farm income proxies. Both of these elements have a significantly different effect on the work satisfaction of Swiss farmers. Their work satisfaction is not affected by farm size and the positive effect of the perceived financial situation of the farm is significantly less strong for Swiss farmers than for German ones. Thus, monetary return seems to play a major role in utility of farming for NE German farmers, whereas it is less important for Swiss ones. Additionally, the Swiss agricultural system seems to offer qualities besides economic returns for its farmers as they are generally more satisfied with their work despite the lower economic return compared with NE German farmers.

4.2 Paper 2 – *Diversification and work satisfaction - testing a claim by Marx and Engels for farmers*

This second article again uses the farmer's work satisfaction as a target variable but this time from a different premise. The focus here is on the connection between work satisfaction and different measures of job variety, testing the claim of Marx and Engels that the diversification of working lives would be positive for workers' satisfaction.

Published in: *Rural Sociology*

Mann, S. and Besser, T., 2016. Diversification and Work Satisfaction: Testing a Claim by Marx and Engels for Farmers. *Rural Sociology*, doi: <http://dx.doi.org/10.1111/ruso.12129>.

Abstract

In conventional economics, a great deal of energy has been devoted to empirical validation of the benefits of specialization in terms of efficiency, in fields including the agricultural sector. Marx and Engels' claim that the diversification of working lives would increase work satisfaction has gained attention among social scientists but has never been verified for the agricultural sector, despite a growing body of literature on the determinants of work satisfaction. Based on a survey of Swiss and North-East German farmers, this study shows that farm diversification significantly increases work satisfaction. This applies both to the lines of agricultural production pursued on a farm (in Switzerland) and to the farm's non-agricultural activities (in both regions).

4.3 Paper 3 – *Agricultural structure and farmers’ interconnections with rural communities*

This third article investigates the connections between the agricultural structure and different proxies of farmers’ interconnectedness.

Published in: *International Journal for Social Economics*

Besser, T., Jurt, C. and Mann, S., 2017. Agricultural structure and farmers’ interconnections with rural communities, *International Journal of Social Economics*, Volume 44 (3), pp. 362-376, doi: <http://dx.doi.org/10.1108/IJSE-09-2015-0237>.

Abstract

Purpose — In the context of rural development, the question how farmers are interconnected with local rural communities is crucial, as farmers historically have played a key role in rural areas, always shaped by the cultural-systemic context in which they acted. This paper explores this connection in Northeast (NE) Germany and Switzerland, two countries whose agricultural systems can be seen as diametrically opposed to each other with respect to their structure.

Design/methodology/approach — We conducted a survey on NE German and Swiss farmers to assess the connectivity between farms and rural communities in terms of the farm managers’ perceptions of their social networks, social support, sense of belonging, and active involvement in organizations.

Findings — The results show commonalities and differences between both study regions. Smaller farms are characterized by strongly locally based networks and a higher sense of community belonging, whereas larger farms rather have networks with strong ties outside the local dimension. Moreover, farmers’ local origin and farm diversification are positively associated with strengthening the connection between farms and local communities. Off-farm work is a means for this connection only in NE Germany.

Originality — This paper contributes to the discussion about adverse effects of farming scale and corporate farming on community well-being by simultaneously delivering insights into two structurally different agricultural systems. At the same time our approach allows for a comparison between the systems.

4.4 Paper 4 – *Comparing preferences for agricultural landscapes across systemic and national borders*

In this fourth article, differences and commonalities in public landscape preferences are compared between East Germany, representing a large-scale agricultural system, and South Germany and Switzerland, representing two small-scale agricultural systems.

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Comparing preferences for agricultural landscapes across systemic and national borders

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Abstract

It is obvious that agricultural production shapes landscapes, but less obvious if and in which ways public landscape preferences differ between regions with different agricultural structures and hence with different landscapes. We conducted two identical discrete choice experiments in East Germany (n=141), South Germany (n=265), and Switzerland (n=388) in order to compare stated preferences for landscape attributes in two ways: first, by comparing a large-scale, corporate farming system with two small-scale, family farming systems (East Germany vs. South Germany/Switzerland) and, second, by identifying cross-border differences (East and South Germany vs. Switzerland). Interviewees were confronted with a status quo scenario and two alternative scenarios presenting potential future landscape development paths. The attributes were expected to be relevant for respondents from different backgrounds with respect to agricultural landscape configurations.

Using a two-class latent class approach, we show that in all regions a smaller class of respondents has a more conservative preference system and a larger class is generally more change-oriented. We find strong overlaps in landscape preferences between the two German regions. Swiss respondents differ from German ones with respect to their positive attitude toward reforestation and increased levels of biodiversity (the conservative class) and regarding reforestation and plot size increases (the change-oriented class). More biodiversity is a general desire among Swiss respondents, regardless of class membership.

Respondents from small-scale agricultural systems (South Germany and Switzerland) have two features in common: highest willingness-to-pay (WTP) is found for a large increase in levels of biodiversity in the landscape, and the highest negative WTP is found for increasing sizes of agricultural and forest plots. The time for which

respondents had lived in their place of residence is a particularly significant predictor of their class membership, although this works differently in the German regions than in Switzerland. Furthermore, in the small-scale farming systems, younger and more environmentally aware respondents tend to belong to the change-oriented class. In all regions, the change-oriented majority is in favor of greater biodiversity, more pastures for free-range animal husbandry, and more traditional meadow orchards in the landscape.

1 Introduction

Agricultural production is dependent on regulating and supporting services provided by nature. Examples of the former are natural pest control or pollination, whereas nutrient recycling or soil formation would be examples of the latter (Millennium Ecosystem Assessment, 2005). While modern agriculture, especially the intensive production of food and fiber in agricultural landscapes using chemical fertilizers, pesticides, and large livestock herds, undeniably produces dis-benefits (or negative externalities) for society such as habitat and biodiversity loss or nutrient and pesticide runoff (Swift et al., 2004; Swinton et al., 2007; Zhang et al., 2007), it also provides a variety of public goods. These include water supply, soil conservation, and climate stabilization through carbon storage but also the agricultural landscape itself as an aesthetic element for the eye of the tourist or the rural dweller (Zhang et al., 2007; Cooper et al., 2009; Power, 2010). As these public goods represent non-marketed services from agricultural ecosystems, there is no price to value their contribution to society's welfare. Commonly, public payments are transferred to farmers to compensate efforts to provide these services, for example through cross-compliance for direct payments. Especially in the case of aesthetic landscapes, it is important to know what kind of landscapes society actually wants in order for policy measures to be properly targeted.

Public landscape preferences have been studied intensively across disciplines such as environmental psychology, landscape ecology, and environmental economics, using a wide range of methodological approaches (Van Zanten et al., 2014). In particular, stated preference methods such as contingent valuation or discrete choice experiments (CEs) have been widely used to derive public willingness-to-pay (WTP) for agricultural landscapes and their elements (e.g. Campbell, 2007; Arriaza et al., 2008; Borresch et al., 2009; Sayadi et al., 2009; Hynes and Campbell, 2011). Studies mostly have a distinct regional focus and therefore investigate a particular agricultural landscape, which often restricts findings to specific regional contexts and landscapes. However, the topographic, climatic, and socioe-

conomic diversity in Europe is reflected in the diverse national and regional development of agriculture. We find highly contrasting agricultural systems in relative close proximity to each other, and the associated landscapes can also differ considerably. The question whether public preferences for certain landscape elements differ between people from different provenances and landscapes has rarely been addressed. Van Zanten et al. (2014) summarized the findings of the numerous regional or national European case studies on preferences for agrarian landscapes from different disciplines. They identified generic preferences for mosaic landscapes, historic buildings or livestock in the landscape and found context variables such as population density or GDP per capita to have an influence on people's preferences.

However, studies comparing the general public's preferences for agricultural landscapes across country borders as well as between agricultural systems of differing intensities and scales using a single methodological approach are missing to our knowledge. And yet, especially in matters of comparability of study findings, methodological uniformity might be crucial. In order to fill this gap we conducted a cross-country valuation of agricultural landscapes and used a single choice experiment for different regions. As our study regions we chose East and South Germany as well as Switzerland in order to investigate public landscape preferences in regions with contrasting agricultural production systems and thus also with wide differences in the resulting landscapes. The East German sample represents residents from a large-scale agricultural system dominated by non-family farms. In contrast, the South German and Swiss samples include residents from more small-scale agriculture dominated by family farms. We check if public preferences for agricultural landscapes differ between contrasting agricultural systems within a country, between contrasting agricultural systems in different countries, and between similar agricultural systems in different countries. The latter comparison tests whether it is the cultural identities of two different nationalities that affect landscape preferences, or systemic differences between large-scale and small-scale systems. Furthermore, we examine if there is an attachment to the individual's familiar surroundings and if this is related to provenance.

2 Landscape preference analysis and choice experiments

Choice experiments are very valuable for analyzing preferences for a multidimensional public good such as an agricultural landscape, as they have the advantage that attribute values and thus marginal effects can be estimated (Bennett et al., 2004). In Europe,

numerous CE studies have focused on public preferences for landscapes described by landscape elements; many of these studies were conducted in Spain (e.g. Arriaza et al., 2008; Domínguez-Torreiro and Soliño, 2011; de Ayala et al., 2015) and the UK (e.g. Hanley et al., 1998; Campbell, 2007; Hynes and Campbell, 2011).

CEs were also applied in our study regions. For Germany, two studies in the federal state of Hesse investigated the possibilities to assessing the multifunctionality of agricultural landscapes using CEs. Schmitz and Schmitz (2003) assessed landscape preferences in two rural municipalities and the city of Giessen for different landscape functions such as water quality and biodiversity and estimated the WTP for potential future landscape scenarios. They illustrated public welfare losses for an intensification/enlargement scenario and for a forest and bush encroachment scenario. Borresch et al. (2009) showed for another Hessian region that a multifunctional landscape is most preferred by the population compared with other landscape scenarios. A third study compared visitors' preferences for landscape features in the agricultural landscapes of the North-East German region Märkische Schweiz and the Dutch municipality of Winterswijk (Van Zanten et al., 2016). In general, diverse landscapes were preferred in both regions. However, whereas in the German region point elements and high crop diversity had the highest relative importance, the visitors to the Dutch region most liked linear elements (e.g. hedgerows) and grazing animals in the landscape.

In Switzerland, Huber et al. (2011) asked local politicians to choose their preferred future land-use scenarios in order to identify those scenarios that would be backed by parliamentary votes. Especially scenarios that shift the focus too much away from the production function of agriculture were strongly opposed by parties on the right of the political spectrum. Home et al. (2014) surveyed the population of a region of special ecological importance on the Swiss plateau and found no clear preference for more complex landscapes with a higher number of ecological landscape elements. Only half of the respondents showed a clear preference for more complex landscapes; the other half showed no distinct preferences. Lastly, Schmitt et al. (2005) surveyed the population of a model region on the Swiss plateau and found positive WTP for landscape elements such as hedgerows or trees or for low-intensity grassland.

Studies comparing landscape preferences between different regions are rare. We therefore applied CEs in regions with different agricultural structures and hence with different agricultural landscapes using a comparative approach such as that employed by Van Zanten et al. (2016), but focusing on the general public.

3 Methodology

Study regions

The study regions, East and South Germany as well as Switzerland, are all situated in Central Europe (see Figure 1). However, despite their close proximity, differences in the natural environment, in influences of market forces on agricultural production, and in (past and present) societal and political decision-making have led to quite different agricultural landscape structures.

While the proportions of forest are comparable between the regions, we find distinct differences regarding agricultural plot sizes. In East Germany, today’s agricultural landscapes are a relic of feudal times and of collectivization during the communist German Democratic Republic (GDR). Extensive land consolidation led to landscapes structured into large-sized fields managed mainly by huge agricultural production cooperatives (Mann, 2004; George, 2010; Jezierska-Thöle et al., 2014). The management trend in East German agriculture has been toward further intensification since reunification (George, 2010). Here, East German agriculture serves as a blueprint for a large-scale, industrialized agricultural system. A contrasting agricultural structure is found in South Germany and Switzerland. Both regions represent more small-scale, family farm based agriculture with

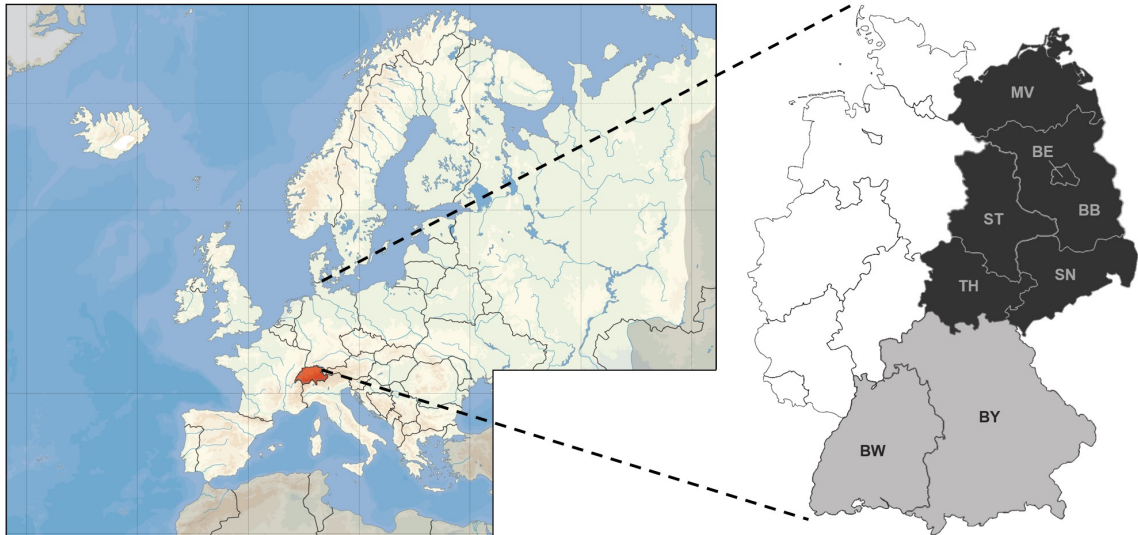


Figure 1: Location of our study regions in Europe. East Germany (black) comprises the federal states of Brandenburg (BB), Berlin (BE), Mecklenburg Western Pomerania (MV), Saxony (SN), Saxony-Anhalt (ST), and Thuringia (TH); South Germany (gray) is represented by Baden-Württemberg (BW) and Bavaria (BY). Switzerland is marked red in the overview map (figure adapted using material from Liuzzo, 2006 and 2007).

more than 90 percent of all farms being family-owned. Average field sizes are on an equally small level. Especially in Switzerland, political interventions realized by a very high level of subsidies (OECD, 2013) have slowed down structural changes and preserved the traditional small-structured landscapes (Baur, 2000).

The dichotomy between the two systems also holds for the situation of traditional meadow orchards as characteristic landscape elements that have a high value in terms of biodiversity and the provision of ecosystem services (Plieninger et al., 2015). The South German state of Baden-Württemberg still has the largest areas of traditional meadow orchards in Europe. Nevertheless, even here, considerable losses of about 22% were observed for one exemplary region in the state, nearly two-thirds of which were converted to tree-less agriculture followed by one-third which was converted to built-up land (Plieninger et al., 2015). In Bavaria and Switzerland too, much of the former meadow orchard acreage was lost in the second half of the 20th century. For example, 70% of all scattered fruit trees were lost in Switzerland between 1951 and 1991 (Herzog, 1998). Yet, the remaining stocks are still comparably high. In East Germany the proportion of young trees has been estimated to be lower than in West German states (Zander, 2003) and about 70% of former orchard tree populations vanished during GDR times (1949-1990) (Rösler, 1996). In Mecklenburg Western Pomerania, for example, most of the remaining meadow orchards are expected to disappear due to over-aging of the tree population (Müller et al., 2009). A similar trend is expected for Saxony, where orchards exist in many regions but are expected to disappear from the landscape (Kirschner, 2005).

Finally, in Switzerland, most cattle are kept partly on meadows. This more extensive and hence more cost-intensive form of animal husbandry is subsidized through cross-compliance programs for animal welfare. In both German regions, especially South Germany, most cattle are kept indoors year-round.

Questionnaire and sampling

The Swiss questionnaire was a condensed version of the German one and did not include every question asked in the German samples. Apart from the CE, other common parts of the questionnaire included questions about basic sociodemographic data (e.g. age, sex, educational level), additional socioeconomic information (e.g. household size, personal and household income, time living in place of residence), and respondents' usage of (local) landscapes.

The CE was conducted as part of a larger survey on a representative sample throughout

Table 1: Data on the study regions' landscapes. For Germany, data for the states considered is also shown (BB – Brandenburg; BW – Baden-Württemberg; BY – Bavaria; MV – Mecklenburg-Western Pomerania; SN – Saxony; ST – Saxony-Anhalt; TH – Thuringia).

	East Germany		South Germany		Switzerland	Sources
Share of forested area (in %)	BB	37	BW	38	32	BMEL, 2014; BAFU/WSL, 2015
	MV	24	BY	37		
	SN	29				
	ST	26				
	TH	34				
Average size of agricultural plots (in ha)	30-50		BW	1.35 (cropland) < 1 (grassland)	1.49 (cropland) 0.76 (grassland)	Thiemann, 2007; SLA BW, 2013; BFS, 2015; LfL, 2015
			BY	1.74		
Share of cattle with access to meadows (in %)	Tot.	38	Tot.	17	82	SBA, 2011; BLW, 2014
	BB	42	BW	27		
	MV	46	BY	14		
	SN	30				
	ST	31				
	TH	33				
Traditional meadow orchards	BB	534 ha	BW	≈ 9.3 m trees	≈ 2.2 m trees	Müller et al., 2009; Pfeiffenberger, 2013 cited after Harth and Strutzke, 2014, p. 117; StMELF, 2014; MIL, 2014; MLZ, 2015; BLW, 2015
	MV	≈ 611 ha		$\approx 160,000$ ha	-	
		$\approx 0.1 \frac{\text{trees}}{\text{ha}}$		$\approx 6.53 \frac{\text{trees}}{\text{ha}}$	$\approx 2.13 \frac{\text{trees}}{\text{ha}}$	
		≈ 136 k trees	BY	≈ 6 m trees		
	SN	no data		-		
	ST	no data		$\approx 1.91 \frac{\text{trees}}{\text{ha}}$		
	TH	10,068 ha				

Germany in March 2013. 1462 usable interviews were conducted. Of these, 167 were from the five Eastern German states and 278 from the two Southern German states. The Swiss survey was carried out in March 2015 and resulted in a representative sample of 308 interviews. The sampling for both surveys was done by market research institutes that selected respondents from their online panels. Respondents received a small remuneration for their efforts. Prior to the actual survey, focus groups were formed to determine possible landscape attributes of relevance to the general public. Furthermore, a pilot survey was conducted to test the questionnaire beforehand.

Experimental design

We considered five landscape attributes to be relevant in the differing regional contexts. Each had two possible levels for future development and one status quo level (see Table 2). The levels of the landscape attributes concerning the proportion of forest in the landscape and the plot size of fields and woodlands indicate potential increases and decreases. Only positive development paths were offered for species diversity, the ratio of pastures to all grassland as a measure of the extent of free-range animal husbandry, and traditional meadow orchards. Additionally, we incorporated a price variable with six levels for landscape changes and one cost-free status quo level. The price levels for the Swiss context were converted from Euros to Swiss francs according to regional data on purchasing power and current exchange rates.

We used a fractional factorial design, choosing an efficient design to minimize the standard errors of the parameter estimates (Hoyos, 2010). Furthermore, we applied the D-error as an efficiency criterion for our design (Scarpa and Rose, 2008). This reduced the number of choice sets to 18, which were further divided into two blocks with nine choice sets each to make the process easier for the respondents. Each respondent was then randomly assigned to one of the two blocks.

Econometric approach

Analyzing individuals' choices made in a CE has often been done using multinomial logit models (MNL) as introduced by McFadden (1974). This builds on the random utility theory which defines a good's total utility as

$$U_{int} = V_{int} + \epsilon_{nit} = \beta'_n x_{in} + \epsilon_{nit} \quad (1)$$

The individual n is considered to choose the alternative i in a choice situation t which offers highest utility U . V represents the observable part including variables x such as attributes of the alternatives or individuals' socioeconomic characteristics. The stochastic error part ϵ remains unobserved. The MNL complies with the independence of irrelevant alternatives (IIA) assumption and needs independent and identically distributed (i.i.d.) error terms following a Gumbel extreme value distribution. It implies preference homogeneity between the respondents.

To account for preference heterogeneity we applied latent class (LC) models to the data. This additionally allowed us to determine differences in the preferences of potential

Table 2: Attributes and levels used in the choice experiment. The currency used for the payment vehicle was the Euro (€) for the German sample, and Swiss francs (Fr.) for the Swiss sample.

Attribute	Description		Level 1	Level 2	Status Quo
	<i>German version</i>	<i>Swiss version</i>			
Proportion of forest	The ratio between forests and agricultural area (i.e. fields, pastures, and meadows) could be changed in the long run. Theoretically, woodland could be converted to agricultural areas or such areas could be reforested.		10% lower	10% higher	like today
Plot size (fields & woodlands)	It is also characteristic for landscapes if fields, grasslands, or woodlands are managed as large-scale plots or if smaller plots alternate.		half the size	twice the size	like today
Species diversity	Species richness of agricultural areas can be measured using bird species. For this a scale was developed. If agricultural areas score 100 points or more, they are well suited as habitats for typical animal and plant species. Values below this line are an approximation to such a condition.	For this an index was developed which measures the population development of nationally endangered bird species and of those bird species that reflect a special quality of habitats in agricultural landscapes. The reference is population data from 1990.	1/3 higher	2/3 higher	like today
Proportion of pastures	Free-range animal husbandry on pastures can be characteristic for landscapes. Today, animals are rarely kept on pastures due to higher costs. Supporting farms could increase levels of grazing livestock on pastures in your region.	Today, many animals are already being kept on pastures thanks to financial support for farms. An expansion of such support programs could further increase levels of grazing livestock on pastures in your region.	1/3 more	2/3 more	like today
Meadow orchards	Meadow orchards are a traditional method of fruit production. In these orchards, high-stemmed fruit trees are scattered loosely throughout the meadows. New plantations of such orchards on existing meadows require the planting of trees and professional care.		10 ha new	30 ha new	like today
Annual financial contribution to landscape funds	Financing landscape design measures requires everybody to pay an annual fee depending on the landscape chosen. The money is paid into a special fund which is used exclusively to finance landscape design measures.		10—25—50—80—110—160 (in €) 20—45—90—140—195—280 (in Fr.)		0 € 0 Fr.

subgroups within the samples. In the LC procedure the sample population is expected to hold a certain number of different classes (Q) which is not known beforehand, yet is defined by the analyst (Greene and Hensher, 2003). Underlying the LCM is the logit model:

$$Prob(it, j|q) = \frac{\exp(x'_{it,j}\beta_q)}{\sum_{j=1}^{J_i} \exp(x'_{it,j}\beta_q)} = F(i, t, j|q). \quad (2)$$

In this formulation the logit model describes the discrete choice made by individual i among J_i alternatives. T_i represents different choice situations if one individual faces different choice sets, meaning the data are treated as panel data (Greene and Hensher, 2003). x' are independent variables included in the model and β is a class-specific vector of utility coefficients associated with these covariates (Adamowicz et al., 1998). The probability of an individual i belonging to a class q can be described as follows

$$Pr(iq) = \frac{\exp(z'_i\theta_q)}{\sum_{q=1}^Q \exp(z'_i\theta_q)}, q = 1, \dots, Q, \theta_Q = 0, \quad (3)$$

where z' are observable covariates such as socio-demographic information on the respondents which can be included to explain the class membership (Greene and Hensher, 2003). θ again represents the vector of class specific utility coefficients of the covariates.

Willingness-to-pay (WTP) is calculated using the coefficients (β) of the attributes that describe the landscape (k) as well as the coefficients of the price attributes ($price$):

$$WTP_k = -\frac{\beta_k}{\beta_{price}} \quad (4)$$

The distribution of WTP was estimated using the frequently used Delta method (e.g. Scarpa and Rose, 2008; Schulz et al., 2013). Negative WTP reflects the monetary compensation a respondent requires to accept disliked changes to the landscape. All modeling was done in R 3.2.3 using the `gmm1`-package (Sarrias and Daziano, 2015).

4 Results

Our samples are relatively similar in their sociodemographic composition (see Table 3). Only minor differences can be found for respondents' age, sex, and educational level, whereas the figures for average net household income and the variable for membership of environmental organizations show dissimilarities. Only very few East German respondents

Table 3: Descriptive statistics of the East German (E-DE), South German (S-DE), and Swiss (CH) samples showing mean (min./max.) values.

		E-DE	S-DE	CH
Age	in years	44 (19/75)	44 (15/80)	46 (17/83)
Sex	0 = female; 1 = male	0.52	0.53	0.51
Education	0 = lower secondary; 1 = upper secondary; 2 = A-levels; 3 = university degree	2.17	1.92	2.52
Net household income	0 = < 900 € < 3000 Fr. 1 = 900 - 1200 € 3000 - 5000 Fr. 2 = 1200 - 1500 € 5000 - 7000 Fr. 3 = 1500 - 2000 € 7000 - 9000 Fr. 4 = 2000 - 2600 € 9000 - 11000 Fr. 5 = 2600 - 3300 € 11000 - 13000 Fr. 6 = 3300 - 4500 € 13000 - 15000 Fr. 7 = > 4500 € > 15000 Fr.	4.38	5.11	3.25
In environmental NGO	0 = no; 1 = yes	0.07	0.19	0.17
Duration of occupancy in place of residence	in years	25 (1/68)	24 (0/66)	14 (0/69)
n		167	278	308

are members of environmental organizations. However, in the German samples the average respondent has lived for much longer in his or her place of residence. In the Swiss sample this rootedness of respondents is significantly lower.

Accounting for preference heterogeneity between individuals and acknowledging the panel characteristic of the data using random parameter logit models (RPL) significantly increased model performance compared to the MNL (see Table 4). However, remaining high levels of heterogeneity shown in the standard deviations of the random parameters made us solely use the LC for our study, which enhanced model performance even more. We estimated the models using two classes, as adding a second class increased the model fit significantly. Two classes proved best for reasons of interpretability of results and comparability of results between regions.

This subdivision led to two classes of respondents with highly contrasting preference systems (see Table 5). Generally, the first class is the smaller one in all three regions and is characterized by a general dislike of change. The second class holds between 55% (South Germany) and 59% (Switzerland) of all respondents. Between the German regions in particular, similarities are strong, whereas the Swiss respondents depart from this picture in some respects. Notably, East Germans dislike scenarios with a reduced proportion of forest in the landscape. The high and negative WTP illustrates this even more as it is highest for East Germany. In the South German sample this negative preference is

Table 4: Model fit measures for all study regions and all three model types: Multinomial Logit (MNL), Random Parameter Logit (RPL), and Latent Class (LC) with two classes.

	East Germany			South Germany			Switzerland		
	MNL	RPL	LC	MNL	RPL	LC	MNL	RPL	LC
LogLik	-1523.6	-1194.9	-1190.8	-2568.0	-2113.1	-2085.5	-2932.7	-2701.1	-2612.6
AIC	3081.1	2445.8	2443.7	5163.3	4282.1	4233.0	5894.39	5458.2	5287.2

LogLik = Log-Likelihood; AIC = Aikaike Information Criterion

less distinct, and in the Swiss sample the attribute level does not significantly influence people's preferences at all. Positive preferences in the conservative first class of the Swiss sample are found for reforestation. Whereas not significant in the German samples, Swiss respondents opt for reforestation scenarios.

Any changes in the plot size of fields and woodlands are uniformly rejected by Class 1 members in all regions. However, for South Germans (and regarding an increase of plot sizes, also for the Swiss), these rejections are especially distinct. Whereas Class 1 East Germans show highest negative WTP for forest loss, South Germans in this class most dislike enlargement followed by shrinking plot size scenarios. For the Swiss in Class 1, larger plot sizes are most rejected.

Preferences of Class 1 members for the other three remaining attributes differ between the regions. A moderate increase in biodiversity is very clearly favored in the first class of the Swiss sample. Of the two positive preferences in this Swiss class, increasing levels of biodiversity has the higher WTP. While the level of a moderate increase of grazing livestock in the landscape does not significantly influence choices in the first classes of all samples, South German and Swiss respondents in Class 1 dislike a large rise in levels of grazing livestock in the landscape. Nevertheless, in the Swiss sample this is just a tendency. Traditional meadow orchards only play a role for class members in the German samples. In particular, South Germans show a clear aversion to a large increase of orchards acreage. Finally, Class 1 members have a highly significant preference for scenarios that cost less, and have neither a general preference for the status quo nor for changes which would be captured by the alternative specific constant for the status quo (ASCsq).

Most of the respondents are found in Class 2 in all samples. Again, there are more similarities between the German regions, but also compared with the Swiss second class we see preference overlaps. Changes in forest cover are again judged differently in Germany and Switzerland as German respondents in this class have a very strong aversion to forest losses and favor reforestation scenarios. The negative WTP is by far the highest of all attributes and is especially high in the East German sample. With respect to forest

cover, Class 2 Swiss respondents tend to reject all possible changes; however, compared to German respondents, they dislike reforestation more than forest loss.

Plot sizes also show a differentiated picture between Class 2 respondents of the German samples and of the Swiss one. Whereas shrinking plot sizes are similarly unwanted in all regions (but again most clearly for the South Germans), increases in plot sizes do not affect the choice process of Swiss Class 2 members, in contrast to the German regions.

While biodiversity plays no role for German Class 1 members, Class 2 respondents strongly support a considerable increase in biodiversity in the agricultural landscape. In particular, South Germans are willing to pay a high price for more biodiversity in the landscape compared with other attributes. Yet, also for East German and Swiss respondents this attribute reaches high WTP. The similar preference pattern repeats itself for the large increase in the proportion of pastures for grazing livestock. East Germans in Class 2 have the highest desire for animals in the landscape while the WTP for South Germans and Swiss respondents in this class is on a comparative level. Moderately increasing the acreage of meadow orchards is the most important issue for Class 2 East German respondents. In the South German and Swiss sample a large increase in the area for meadow orchards is preferred. While the price vehicle shows the same expected significance and direction as in the first class, the second class also generally favors changes to the landscape over the status quo in the areas surrounding their place of residence.

In South Germany, respondents' income and education do not influence their class membership. In East Germany, however, respondents with higher incomes and lower education are more likely to be found in the change-driven second class. In Switzerland, these variables work in the opposite direction. Respondents' sex only plays a role for the grouping in South Germany where men are predominantly found in the change-averse first class. This class furthermore tends to hold more older South German and Swiss respondents. Membership of an environmental organization increases the likelihood of a person being found in the second class, but only in the small-scale agricultural systems of South Germany and Switzerland. In East Germany the sample contained very few respondents with such memberships. Lastly, the longer German respondents have lived in their current landscape the more they tend to be found in the conservative first class. In Switzerland this is the other way around.

Table 5: Results from the two-class latent class model showing the coefficients of the landscape attributes, the alternative specific constant for the status quo scenario (ASCsq), and willingness-to-pay (WTP) and its confidence interval (95%).

		East Germany		South Germany		Switzerland	
		Est.	WTP	Est.	WTP	Est.	WTP
Cl. 1	Forest (↓)	-1.224***	-60.14 (-101.11/-19.17)	-0.567*	-42.53 (-81.62/-3.43)	-0.194	-12.06 (-34.56/10.43)
	Forest (↑)	0.044	2.15 (-32.49/36.79)	-0.081	-6.1 (-39.79/27.59)	0.504*	31.41 (3.66/59.16)
	Plot size (↓)	-0.677*	-33.26 (-75.07/8.55)	-0.747***	-55.97 (-98.32/-13.62)	-0.359*	-22.35 (-44.52/-0.19)
	Plot size (↑)	-0.876*	-43.02 (-89.45/3.4)	-0.885***	-66.37 (-111.26/-21.48)	-0.853***	-53.13 (-85.65/-20.61)
	Biodiversity (↑)	0.200	9.83 (-21.81/41.47)	0.239	17.88 (-12.75/48.51)	0.807***	50.28 (22.45/78.12)
	Biodiversity (↑↑)	0.078	3.85 (-39.64/47.34)	-0.366	-27.46 (-71.48/16.56)	0.288	17.96 (-4.18/40.1)
	Pastures (↑)	-0.063	-3.08 (-43.99/37.83)	-0.199	-14.92 (-54.73/24.88)	0.313	19.48 (-5.43/44.4)
	Pastures (↑↑)	-0.158	-7.75 (-48.66/33.16)	-0.613*	-45.98 (-93.48/1.51)	-0.376~	-23.41 (-51.82/5)
	Orchards (↑)	0.315	15.46 (-16.04/46.96)	-0.158	-11.84 (-48.51/24.84)	-0.003	-0.18 (-24/23.65)
	Orchards (↑↑)	-0.848*	-41.67 (-94.08/10.74)	-0.653**	-48.93 (-94.58/-3.28)	-0.265	-16.49 (-41.79/8.82)
	Price	-0.020***		-0.013***		-0.016***	
	ASCsq	0.373		0.056		0.279	
Cl. 2	Forest (↓)	-1.528***	-261.41 (-113.02/-95.85)	-0.880***	-137.36 (-227.55/-47.17)	-0.168~	-30.96 (-128.06/17.33)
	Forest (↑)	0.307**	52.54 (-135.99/94.32)	0.241**	37.64 (10.26/65.02)	-0.433~	-79.77 (-146/31.64)
	Plot size (↓)	-0.551**	-94.21 (-141.52/-13.2)	-0.583***	-90.91 (-148.65/-33.17)	-0.188*	-34.6 (-54.27/14.94)
	Plot size (↑)	-0.354**	-60.52 (-8.26/5.45)	-0.382***	-59.54 (-105.93/-13.14)	-0.026	-4.73 (-1.29/59.15)
	Biodiversity (↑)	0.337	57.71 (2.49/139.32)	-0.164	-25.61 (-95.96/44.75)	0.340	62.6 (-11.2/151.49)
	Biodiversity (↑↑)	0.491***	84.1 (-14.66/126.25)	0.443***	69.12 (42.33/95.9)	0.422***	77.7 (15.37/113.05)
	Pastures (↑)	0.161	27.49 (-19.83/109.25)	-0.032	-5.06 (-58.95/48.83)	0.275	50.72 (-32.16/126.11)
	Pastures (↑↑)	0.362*	61.93 (50.96/103.53)	0.280*	43.72 (15.09/72.34)	0.235*	43.24 (11.12/71.1)
	Orchards (↑)	0.541**	92.56 (-71.79/172.23)	0.222	34.64 (-15.19/84.47)	0.212	38.98 (4.79/86.63)
	Orchards (↑↑)	0.046	7.88 (-43.42/51.3)	0.340**	53.05 (25.29/80.81)	0.285**	52.44 (-30.46/82.91)
	Price	-0.006***		-0.006***		-0.005**	
	ASCsq	-1.797***		-2.101***		-1.515***	
Cl. 2	Income	0.173***		-0.042		-0.074**	
memb.	Sex	-0.171		-0.560***		0.054	
-ship	Education	-0.135*		0.022		0.088~	
	Age	-0.007		-0.006~		-0.008*	
	Environ. NGO	0.190		0.801***		0.797***	
	Dur. of occupancy	-0.013***		-0.018***		0.023***	
n		167		278		308	
Cl. 1 (in %)		44		45		41	
Cl. 2 (in %)		56		55		59	

Significance level: ~ = 10%; * = 5%; ** = 1%; *** = 0.1% — Attribute development: ↓ = decrease; ↑ = increase; ↑↑/↓↓ = strong increase/decrease

5 Discussion

The objective of the study was to compare preferences between regions with similar and differing agricultural landscapes. The gradient in negative WTP and in the significance of the coefficient of the forest loss level illustrates a differing valuation of forests in the landscape. This observation is true for both latent classes, although it is much more pronounced for the second one. Especially in the change-oriented second class of both German regions, this aversion to forest loss is rated much more highly than possible anticipated gains from the attributes of reforestation, biodiversity, grazing animals, or traditional orchards, which are mostly positively appraised. In the East German sample this strong aversion to forest losses applies across classes. Such a loss aversion pattern is a regular anomaly in the often assumed rationality of people's decision-making processes and has been related to the widely observed tendency to prefer the status quo over change (Kahneman et al., 1991). While the ASCsq does not suggest such a status quo effect in our samples and for Class 2 indeed suggests the contrary, nearly all regions and classes wish to preserve the status quo regarding the basic structure of agricultural landscapes, namely plot sizes. For conservative respondents of the Southern small-scale agricultural landscape, an increase in plot sizes is of major concern.

Interestingly, with regard to the attitudes toward forest cover loss and reforestation in the first class and toward an enlargement scenario of plot sizes for the second class, the Swiss sample differs from the East and South German samples, which are rather uniform in their preferences for these attributes. In Switzerland, various studies have analyzed the populations' attitudes with respect to forests and forest development at different points in time. Most people are satisfied with the current forests acreage in Switzerland ($\approx 60\%$ in 1978, 76% in 1998, and 76% in 2012), a considerable proportion perceives it as too small (36% in 1978, 23% in 1998, and 19% in 2012) and only a small minority finds it too large (Hertig, 1978; BUWAL, 1999; Hunziker et al., 2012). At the same time they feel that Swiss forest cover has declined in the past (Hertig, 1978; BUWAL, 1999) as has that of their own region (Hunziker et al., 2012). Similarly, in Germany, three-fourths of people were found to believe that forest cover was decreasing (Kleinhüchelkotten et al., 2009). This perception of forest loss, which contradicts the reality of generally increasing forest cover in recent decades, might explain the strong aversion to "further" losses in our study. Especially in Switzerland, our respondents are either indifferent to forest reductions and support reforestation (Class 1) or, to a larger extent, are satisfied with forest cover and averse to any changes (Class 2).

Focusing on the results for increasing biodiversity in the agricultural landscape, we see that in Switzerland appreciation of the significance of biodiversity seems to be more widespread within the general public. While preferences differ with regard to the level of increase, there is a general consensus on increasing biodiversity in the landscape. Respondents of both Swiss classes prefer landscape scenarios in which the level of biodiversity is increased and have highest WTP for it. In the German samples, only the second change-oriented class prefers higher levels of biodiversity, and in South Germany this is the most important positive change. Among other studies, the two German studies by Schmitz and Schmitz (2003) and Borresch et al. (2009) also found WTP for species richness.

Concerning increased levels of grazing livestock in the landscape, the two classes hold contrasting views, especially in the small-scale agricultural system of South Germany and Switzerland dominated by feed-producing farms. Class 1 respondents represent a rather conservative preference orientation, which is also reflected in preferences with regard to enhanced levels of grazing livestock. While in East Germany respondents are indifferent concerning this attribute, South German and Swiss respondents have negative WTP for it. This changes for the second class. Here, respondents of all regions prefer livestock to have more opportunities to graze on pastures and this attribute is most important for people from East Germany. In the East German state of Brandenburg, for example, industrial livestock farming is a particularly prominent public issue which peaked in a public referendum in early 2016. For Swiss respondents, the positive valuation of livestock in the landscape is at least partly explained by the existing prominence and visibility of livestock on pastures and the special support paid to farmers to encourage free-range husbandry. In more conservative circles (here, Class 1 respondents) today's efforts might appear to be sufficient.

The differentiated picture between the classes is also reflected in the contrasting preferences with regard to an expansion in the acreage of traditional meadow orchards. Here, the conservative first class, at least in the German regions, rejects too many newly planted orchards and is indifferent toward the moderate attribute level. Even though in South Germany and Switzerland the proportion of meadow orchards in the agricultural landscape is still relatively high compared with the East German situation, the more change-oriented respondents still seem to attribute special value to meadow orchards and want to see more of them in the landscape again. East Germans in this class also want to see a moderate increase in these landscape elements, so there is also an added-value in more alternation in the more intensively used, more monotonous agricultural landscapes of East Germany. In fact, for Class 2 East Germans, meadow orchards are the most preferred landscape

attribute. This illustrates that past losses of scattered fruit trees not only negatively affect ecological functions of agricultural landscapes, but also have negative effects on the landscapes' aesthetic value for society.

The general preferences for more extensive methods of production, such as favoring pasture-based livestock production and a higher proportion of traditional meadow orchards for fruit production, tallies with the higher levels of biodiversity in the landscape preferred among change-oriented Class 2 respondents. The Swiss tendency to reject reforestation may also be connected to the wish for greater biodiversity, as European forests in many cases are not necessarily more species-rich (Reidsma et al., 2006).

The Class 2 members of both German samples have lived within the landscape surrounding their place of residence for less time than Class 1 respondents, which might explain their low attachment to the landscape status quo and general willingness to depart from it. In turn, this covariate also explains the strong attachment of German Class 1 members to the status quo. While the variable is also highly significant in the Swiss sample, the direction of its effect is opposite to that in the German samples. The average Swiss respondent has lived in their place of residence for a much shorter time than German respondents, which seems to influence the covariates' different behavior in the Swiss sample. With regard to duration of occupancy in the place of residence, the Swiss sample seems to be composed differently. The change-oriented Class 2 respondents tend to be members of environmental NGOs, which makes sense as the landscape attributes only changed the landscapes to more diverse and more ecological states, and those attributes with negative or more neutral directions of change were mostly rejected. We therefore assume that "environmentalists" see the need to change current methods of agricultural production in such a way that more ecologically sound landscapes are provided to society. This coincides with findings from other studies that found landscape preferences to be affected by environmental value orientation and environmental interest (e.g. Kaltenborn and Bjerke, 2002). As for respondents' age, in the East German sample no effect is found for this variable, while at least the signs of the coefficients take the same direction as for the other two samples. So one could say that the older people become, the more they tend to prefer the status quo. Class 2 respondents from the Swiss sample tend to have higher levels of education, which further highlights that the connection between preferences for more extensive production methods and higher wanted levels of biodiversity are a result of a more informed decision-making process.

The subdivision into two classes yielded two groups of respondents who differ in many ways, yet also have commonalities with respect to preferences toward landscape changes.

The first class rejects most changes to landscape elements or the attributes play no role in the respondents' preference system. This is especially the case for both German regions. The second class tends to opt for changes to the current status, but with the exception that forest area should not decrease (and in the Swiss case also not expand) and that the plot sizes of fields and woodland should not change. This change-oriented class contains the majority of respondents. Interestingly, the people choosing reforestation scenarios in the Swiss sample are found in the more restrictive, conservative Class 1 which is in contrast to the situation in the German study regions. The spread of preferences for biodiversity across classes also differentiates the Swiss case from the German ones. Biodiversity as an issue might be more prevalent in the minds of the general Swiss public.

6 Conclusion

With its comparative approach, our study contributes new insights into differences in preferences for landscape elements across agricultural systems and national borders. Subdividing respondents into two classes using the latent class approach can help to further account for, and to a certain degree analyze, the unobserved heterogeneity that remained after introducing random parameters to the rather inflexible multinomial logit models. The two resulting classes revealed contrasts between conservative and change-oriented viewpoints and preferences, but also commonalities that both classes share.

Especially between the two German regions, the shared preferences outweigh the minor differences and exemplify that regional culture might be influential. In both German regions, the two-class approach results in two classes with nearly identical preference systems and the differentiation between conservative and reform-oriented groups seems very appropriate. However, the disapproval of deforestation and plot size changes unites both groups. The Swiss case shows that while, here too, one class is more conservative and restrictive with respect to landscape changes, it also sees a certain value in qualitative changes as resulting from an increase in forest cover or in levels of biodiversity in the landscape. Biodiversity in particular seems to be an important issue in Switzerland regardless of a person's general preference system. The preferences of the second Swiss class, which, as in the German regions, also includes more reformers, show a higher degree of informed decision-making in relation to the connections of biodiversity and changes to landscape elements.

This study shows that preferences for agricultural landscapes are in some ways similar across study regions and that there are certain classes within society that evaluate land-

scape elements in different ways. The preference for qualitative changes to the landscape seems to be more prevalent in Central European countries than the urge to maintain the status quo. This general tendency shows that land-use policies designed to extensify agricultural production are generally backed by the majority of the population. The national discourse around certain landscape attributes might promote the diffusion of preferences across such different views.

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Chapter 5

Overall conclusion

This dissertation project comprised work on different aspects of agriculture's non-commodity output functions as shown in the presented research papers. Both social and aesthetic functions were considered and related to the two opposing agricultural systems represented by our study regions. For the social functions, a standardized farm household survey was used; for the aesthetic functions, discrete choice experiments were conducted. The focus of the project shifted from the farmer, more specifically his/her workplace, to the farmer as an element in his/her rural community. Finally, it zoomed out to capture the viewpoint of the general public on agricultural landscapes. The following sections briefly summarize and discuss the main findings, give an outlook for potential starting points for future research, and draw a final conclusion.

5.1 Main findings

With regard to the function of the agricultural workplace, the first two research papers showed systemic and structural influences on the indicators. The monetary output of agricultural work seems to be valued more highly in the Northeast German states of Brandenburg and Mecklenburg Western Pomerania than in Switzerland. In these German states, farmers on large farms and those who rate their farm's financial situation positively have higher work satisfaction. In Switzerland, work satisfaction is not affected by farm size and the financial situation affects satisfaction significantly less positive than in Northeast Germany. Furthermore, the number of farms' production lines and the number of income-generating non-agricultural diversification activities on the farm, for example agrotourism or direct sales, positively affect Swiss farmers' satisfaction with their work. For Northeast German farmers, it does not matter whether the farm has different production branches or whether it specializes in a single area. As the valuation of monetary utility of farm

work seems to differ between systems, it appears appropriate to follow different strategies if farming is to be preserved as an attractive occupational choice in the future. One of agriculture's most important social functions for rural areas and their development is employment, and diversification of the agricultural workday might contribute to enhanced working conditions and consequentially to higher work motivation.

The third paper moved away from the workplace and observed the farmer as a constituent of the local community. The results revealed effects of structure on farmers' social interconnectedness and differences between the two systems in this regard. Swiss farmers have a more locally based network of close friends and relatives. The scale of farming, measured by farm size, socially disconnects farmers from their local community in both systems, whereas a larger workforce generally increases farmers' feelings of belonging to their local community and the overall size of their social network. Special mentioning should be made of the fact that farmers with a biographical connection to their farm are clearly more rooted in the local community; this highlights the significance of locally-rooted farmers for rural cohesion, but also shows how difficult the position of newly entering farmers might be. Especially visible are the differences between the systems when looking at the external workforce and the relevance of off-farm workload for Northeast German farmers: both have positive effects on their local networks and in the case of workforce also on the sense of community belonging. Again, diversification into non-agricultural income-generating activities is noteworthy as it mostly positively affects the social indicators. From the findings one can infer that, in a small-scale agricultural system like the Swiss one, farmers' social connections are more focused on the local level than it is the case in a large-scale system and that tradition matters in farming regardless of the agricultural system. However, it is the provenance of the farmer which matters and not so much whether he or she manages a family farm or a cooperative.

By taking the perspective of the general public on agricultural landscapes in the study regions, the fourth paper captures systemic differences and commonalities concerning the aesthetic function of agriculture. Compared with the other three papers, the study regions are expanded for the fourth. Rather than considering only Northeast Germany, this time the large-scale system is represented by all six East German states as a single East German study region. The small-scaled system is represented by two Southern German states and again by Switzerland. In all samples the respondents could be grouped into two classes: the more conservative group of respondents tends to be indifferent or rejects most of the proposed landscape changes, whereas the change-oriented group of respondents is generally in favor of changes to the landscape. In all samples, the latter group contains the majority of respondents. Change-oriented respondents generally have a preference for higher levels

of biodiversity, for more grazing livestock in the landscape, and for more meadow orchards as landscape elements. Whereas for both German regions rather similar preference patterns have been found, the Swiss sample departs from this in some respects. Deforestation and changes in plot sizes are disliked in all three regions and across classes. Only the Swiss change-oriented respondents are indifferent with respect to plot size increases. In addition, conservative Swiss respondents are in favor of changes with respect to reforestation and, like the change-oriented respondents, of increasing levels of biodiversity in the agricultural landscape. Biodiversity seems to be an important issue within all of Swiss society.

5.2 Outlook

Since the beginning of the industrial revolution, farmers with smaller farms are increasingly being driven out of agriculture due to low competitiveness. This means that larger farms are growing at the expense of smaller ones. As a consequence, agricultural work is increasingly being shouldered by fewer people. A supplementary development is the increasing specialization of many farms which also modifies the nature of farm work. In the Northeast German situation, where financial aspects seemed to matter more, enlarging farms might result in higher satisfaction among remaining farmers. However, with further specialization of Northeast German agriculture, the positive effects of diversification are also becoming less influential for farmers' work satisfaction, and whether financial aspects can outweigh a more monotonous working environment remains an open question. In addition, the increasing redundancy of human work in industrialized agriculture might lead to social problems for rural communities as they lose employment opportunities and potentially experience a further weakening of their internal social networks, as farmers on larger farms tend to have their social ties farther away from local communities. This might lead to a further deterioration of rural communities. One concept which attempts to counteract such tendencies by reconnecting producers and consumers and thus agriculture with local communities is the community-supported agriculture. However, it remains a very marginal phenomenon. Whether such potential implications are also relevant in the Swiss context, in which structural changes are proceeding at a much slower pace than in Northeast Germany, is debatable. Especially in the less productive and less accessible Swiss regions, farmers will probably need to accustom themselves to the thought that they are conservationists rather than producers. This again requires compensation by the state. With regard to changes in rural areas, the relevance of farmers for social cohesion might not be as high as in the Northeast German case, as population densities are higher and rural areas are also home to small- and medium-sized non-agricultural businesses which

might offer opportunities for employment outside agriculture.

Regarding the demand for certain agricultural landscapes, further structural changes might contradict the qualitative landscape changes which are preferred by the majority of the people. In all three regions, most of the respondents opted for changes such as higher biodiversity, more free-range livestock husbandry, and more structured landscapes through newly planted meadow orchards. At the same time, nearly all respondents wanted to keep plot sizes as they are. This reflects a dilemma for agricultural policy as further concentration in the agricultural sector and potential further specialization in fewer products conflict with these desired changes which would require an extensification of production. Thus, providing society with its preferred landscapes might require a paradigm shift away from the maximization of production and profits toward a more sustainable and thus extensive production coupled with the production of public goods by incentivizing their production through cross-compliance.

Methodologically, a further examination using qualitative research methods could deliver a more detailed picture of the effects of agricultural structure and of different systems on agriculture's social functions. Such methods could also help to answer outstanding questions on the causality of significant relationships found, for example, concerning the reasons why off-farm employment negatively affects work satisfaction. In particular, a closer look at the determinants of work satisfaction would be of paramount interest. Comparing satisfaction with particular steps in the work routine or the general working conditions in similar lines of production in different agricultural systems could carve out more details on the nature of farmers' work satisfaction or dissatisfaction respectively. Another approach would be to consider the use of multiple-item job satisfaction measures to quantify farmers' work satisfaction, which would also offer a more detailed picture. Keeping farms in business is a matter not only of finances and profitability but also of keeping the occupation attractive for people from outside, as well as for people from within in times of family succession of their farms. Thus, the determination of factors that improve farmers' satisfaction also gives hints as to how agriculture should look for future generations of farmers.

In addition, a further investigation of farmers' networks from a qualitative perspective would be of interest to complement the quantitative approach followed in this research project. Assessing the quality of social network ties could give further insights into the differences in the networks of farmers working in different agricultural structures. Investigating the types of relationships would differentiate the picture around social networks in order to see whether proximity has the same relevance in regions of differing population dynamics and densities.

With respect to the public landscape preferences in the two agricultural systems, people's attitudes should be more strongly integrated into follow-up research. This would enable the two classes of respondents which were found here to be described and understood in more detail. Furthermore, future comparisons could use landscape scenarios visualized by photo compositions; however, this limits comparability as the proposed landscapes would need to be adapted to regional particularities.

5.3 Overall conclusion

The general lessons learned from this comparative project need to be summarized in different ways. With respect to social functions, some differences between the structurally opposing systems seem obvious and could have been expected in the light of previous research findings. This is true especially with regard to the effects of monetary utility of farmers' work on work satisfaction or the effect of large-scale farming on farmers' social connections with the local community. However, the systems are also connected to each other in some respects. Diversifying into non-agricultural on-farm activities can be seen as a means to raise farmers' work satisfaction overall and to reconnect farms and local communities. Thus, focusing policy measures not solely on maximizing commodity production through specialization of production can be a way not only to make farmers' jobs more enjoyable but also to contribute to rural social cohesion.

Regarding the analysis of people's landscape preferences, one can conclude that the differences between the regions are not very distinct. The results show that a majority of people would be generally in favor of changes to the landscape, particularly if they qualitatively enhance it. This would mean a landscape that has higher levels of biodiversity, where free-range livestock husbandry is extended, and which is characterized by more meadow orchards. However, the main structure, namely plot sizes, should not be changed in any way and the loss of forests is uniformly rejected.

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